

# The PERC Task

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## Background

The last 10 years have witnessed a wide dissemination of the concept of **growth mindset** across schools in the country (Sparks, 2013). Broadly, growth mindset is defined as the belief that one's abilities can be improved through effort and implementing effective strategies. Research studies have shown that encouraging students to implement a growth mindset improves their academic achievement and psychological functioning (Blackwell, Trzesniewski, & Dweck, 2007; Paunesku et al., 2015; Yeager et al., 2014). For example, Blackwell et al. (2007) showed that academic achievement can increase through uplifting students' motivation.

These studies have shown promising outcomes, but our understanding of how holding a growth mindset leads to these positive outcomes is still limited. To expand our understanding of how growth mindset strategies impact school outcomes, we are developing a task designed to assess differences in students' behavior on academic tasks.

### Why was it created?

Students with growth mindset view that intelligence is malleable and failure is a learning opportunity rather than an insurmountable obstacle; these students tend to achieve at higher levels (Blackwell, Trzesniewski, & Dweck, 2007), even in the face of poverty (Claro, Panuesku, and Dweck, 2016). While there is considerable research examining the association between mindset and achievement, there is less known about the process through which mindsets shape this.

Studies have found support for behavioral mechanisms, but one limitation is their use of self-report of behavior. While self-reports are valuable, using them to measure behavior may obscure understanding of the mindset process and introduce possible validation issues. By creating a measurement tool that assesses students' actual behavior during a trying task, we are more precisely able to measure behavior and its relation to mindset.

The task was designed to assess a student's level of:

**P**ersistence

**E**ffort Investment

**R**esilience

**C**hallenge Seeking



## Overview

The PERC is a computer-based task that measures the behavioral expressions of a growth mindset: persistence, effort investment, resilience, and challenge seeking. Previous research suggests that students with more of a growth mindset are more likely to react with a mastery response, seeking challenge, investing effort, persisting through challenge and rebounding after challenge, whereas students with more of a fixed mindset are more likely to react with a helpless response, avoiding challenge, not investing in learning, not persisting when they encounter difficulty.

The design of the PERC is modeled after studies conducted by Dweck and Muller (1998) in which children were asked to solve Raven's Matrices. They began with easy, warm up matrices and then were asked if they would like similar or harder puzzles to assess their challenge seeking, they were then given more challenging puzzles to assess how long they would persist through the challenge. Finally, they were given more easy puzzles to see how resilient they were after the challenge and asked if they wanted to put more effort into the harder puzzles or stick with easy ones.

The PERC captures these four main constructs using similar methodology, adapted to allow group assessments on computer or tablet. The PERC was created to assess these behaviors over a wide range of

### PERC Puzzle Task Format



ages and cross culturally.

**Challenge Seeking**

- Choice of hard or easy puzzles

Easy Puzzle Choice

Hard Puzzle Choice

This graphic features a yellow circle on the left containing the text 'Challenge Seeking' and a bullet point 'Choice of hard or easy puzzles'. To the right are two photographs of a young girl sitting at a desk with a laptop. The top photo is labeled 'Easy Puzzle Choice' and the bottom photo is labeled 'Hard Puzzle Choice'.

**Persistence**

- Measure of time spent doing hard puzzles

ages and cross culturally.

This graphic features a red circle on the left containing the text 'Persistence' and a bullet point 'Measure of time spent doing hard puzzles'. To the right is a photograph of a young girl at a laptop with a clock icon overlaid on the top left corner.

**Effort Investment**

- Measured by time on viewing tip sheet

This one is about dots that disappear. In all the Rows, there is one fewer dot in each box:

	Column 1	Column 2	Column 3
Row 1	••••	•••	••

4 dots    3 dots    2 dots

This graphic features a red circle on the left containing the text 'Effort Investment' and a bullet point 'Measured by time on viewing tip sheet'. To the right is a photograph of a young girl at a laptop. Below the photo is a tip sheet with a 3x3 grid of dots. The text above the grid says 'This one is about dots that disappear. In all the Rows, there is one fewer dot in each box:'. Below the grid, arrows point to the columns with labels '4 dots', '3 dots', and '2 dots'.

**Resilience**

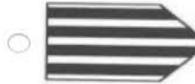
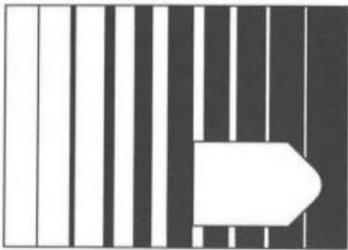
- score comparison of first and last puzzle sets

This graphic features a teal circle on the left containing the text 'Resilience' and a bullet point 'score comparison of first and last puzzle sets'. To the right is a photograph of a young girl at a laptop with a green checkmark icon overlaid on the top right corner.

## Warm Up

Students began PERC by doing four easy puzzles, like this one:

Here's a puzzle with a missing piece. Click on the piece below that completes the pattern.



## Challenge-seeking

Students were then asked what kind of questions they wanted to do next. This was our measure of challenge-seeking.

For the next set of puzzles, which kind would you like to do?

Puzzles at the same level as the first set  
(kind of easy).

Puzzles that are more challenging  
(harder).

*Measure of challenge-seeking.*

## Effort Investment

In the next section of PERC, students had a chance to practice. Students were given three puzzles of medium difficulty:

Puzzle 1. Find the piece that completes the pattern


After each of these puzzles, students were given feedback on whether they answered the puzzle correctly, and they were given a chance to view tips for solving that puzzle.



No, that is not the solution.

Would you like to see how to solve this puzzle?

No, I would like to move on.

Yes, I would like to see how to solve this puzzle.



That's correct.

Would you like to see how we solved this puzzle?

No, I would like to move on.

Yes, I would like to see how you solved this puzzle.

Students were asked if they wanted to view how to solve the question correctly. The amount of time spent on viewing the tip sheet is our measure of **effort investment**. The students choosing to view the tips were shown a page that explained how to solve the puzzle:

It's about two things:  
 1. The shapes  
 2. The filling inside the shapes.

Every row has one of each of these shapes:      Every shape has a different filling inside:

	Column 1	Column 2	Column 3
Row 1			
	One square	One circle	One diamond
	White	Stripes	Black

In Row 3, the only shape missing is the square. The only filling missing is stripes.  
 So the square with the stripes inside completes the pattern.

## Persistence

The next section of PERC included one easy puzzle and then four hard puzzles like this one:

**Puzzle 2**  
 Here's a puzzle with a missing piece. Click on the piece below that completes the pattern. Once you've chosen your answer, choose what you want to do next.


  
    
    
    
  I cannot solve this puzzle

*Sample hard question.*

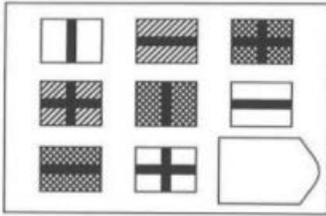
After each puzzle, students could choose whether to stop doing puzzles or to do the next one. The amount of time students spent on the hard questions was our measure of **persistence**.

## Resilience

To conclude PERC, students returned to easier puzzles. We wanted to see if they could bounce back on these after they experienced challenge. Our measure of **Resilience** was whether or not they did as well on the last set as they had on the first set.

### Puzzle 7

Here's a puzzle with a missing piece. Click on the piece below that completes the pattern. Once you've chosen your answer, choose what you want to do next.



- 
- 
- 
- 
- I cannot solve this puzzle
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- 
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*Sample medium puzzle from second resilience measure*

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